



ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือวิเคราะห์

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ TSP	High Volume Air Sampler No. B14, B16, B19, B23	Digital Balance
PM <sub>10</sub>	High Volume PM <sub>10</sub> Air Sampler No. B08, B14, B15, B24	Digital Balance
2. ระดับเสียงในบรรยากาศ L <sub>eq</sub> 1 hr, L <sub>eq</sub> 24 hr, L <sub>max</sub> และ L <sub>90</sub>	Acoustic Calibrator Sound Level Meter ACO No. B01, B16, B29	-
3. คุณภาพน้ำ		
Temperature	-	Thermometer
Color	-	Spectrophotometer
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
Grease & Oil	-	Digital Balance
BOD <sub>5</sub>	-	BOD Analyzer
COD	-	COD Reactor
Nitrate-Nitrogen	-	Spectrophotometer
Phenols	-	Spectrophotometer
Formaldehyde	-	Spectrophotometer
Cyanide as Hydrogen Cyanide	-	Spectrophotometer
Arsenic	-	AAS
Selenium	-	AAS
Barium	-	ICP
Cadmium	-	ICP
		AAS
Copper	-	ICP
		AAS
Total Iron	-	ICP
Manganese	-	ICP
		AAS
Zinc	-	ICP
		AAS
Nickel	-	ICP
		AAS
Lead	-	ICP
		AAS

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
3. คุณภาพน้ำ (ต่อ)		
Mercury	-	AAS
Silver	-	ICP
Hexavalent Chromium	-	Spectrophotometer
Total Coliform Bacteria	-	Incubator
Fecal Coliform Bacteria	-	Water Bath
Total Organochlorine Pesticides	-	GC/MS



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscs.com, www.spscs.com

## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3095

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	04/05/2022	y = 1.313x-9.642	0.999
B02	B02	02/05/2022	y = 1.062x+2.593	1.000
B03	B03	04/05/2022	y = 1.045x+0.757	0.998
B04	B04	04/05/2022	y = 1.161x-3.677	0.996
B05	B05	02/05/2022	y = 1.218x-6.416	1.000
B06	B06	04/05/2022	y = 1.235x-6.768	0.998
B07	B07	06/05/2022	y = 1.178x-5.564	0.999
B08	B08	02/05/2022	y = 1.222x-6.991	1.000
B09	B09	04/05/2022	y = 1.240x-6.649	0.996
B10	B10	04/05/2022	y = 1.091x+0.142	0.995
B11	B11	04/05/2022	y = 1.120x-2.107	1.000
B12	B12	02/05/2022	y = 1.102x-1.916	0.996
B13	B13	03/05/2022	y = 1.187x-5.240	0.999
B14	B14	06/05/2022	y = 1.290x-9.276	0.998
B15	B15	03/05/2022	y = 1.093x-0.919	0.999
B16	B16	04/05/2022	y = 1.223x-6.745	0.999
B17	B17	03/05/2022	y = 1.172x-3.414	0.998
B18	B18	04/05/2022	y = 1.259x-8.700	1.000
B19	B19	03/05/2022	y = 1.307x-10.268	0.999
B20	B20	02/05/2022	y = 1.232x-7.260	0.999
B21	B21	04/05/2022	y = 1.209x-7.461	0.996
B22	B22	02/05/2022	y = 1.239x-7.827	0.999
B23	B23	03/05/2022	y = 1.227x-6.159	0.999
B24	B24	03/05/2022	y = 1.075x-0.925	0.997
B25	B25	04/05/2022	y = 0.997x+2.795	0.998
B26	B26	04/05/2022	y = 1.185x-5.015	0.998
B27	B27	06/05/2022	y = 1.148x-5.099	0.996
B28	B28	04/05/2022	y = 1.221x-6.454	1.000
B29	B29	02/05/2022	y = 1.181x-5.705	0.995
B30	B30	04/05/2022	y = 1.136x-3.406	0.999
B31	B31	04/05/2022	y = 1.114x-1.568	0.999
B32	B32	04/05/2022	y = 1.249x-6.749	1.000
B33	B33	06/05/2022	y = 1.195x-4.397	0.996
B34	B34	04/05/2022	y = 1.222x-7.759	0.999

Calibrated by :

Phakhinai Khongkomnerd  
(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

### High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3095

#### Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	02/05/2022	$y = 1.171x - 0.211$	0.997
B02	B02	02/05/2022	$y = 0.960x + 5.104$	0.998
B03	B03	04/05/2022	$y = 1.214x - 5.211$	0.996
B04	B04	02/05/2022	$y = 1.310x - 9.479$	0.999
B05	B05	03/05/2022	$y = 1.202x - 5.734$	0.999
B06	B06	04/05/2022	$y = 1.241x - 7.631$	0.998
B07	B07	04/05/2022	$y = 1.186x - 4.480$	0.999
B08	B08	03/05/2022	$y = 1.322x - 8.634$	0.999
B09	B09	04/05/2022	$y = 1.219x - 5.756$	0.998
B10	B10	03/05/2022	$y = 1.234x - 7.417$	1.000
B11	B11	02/05/2022	$y = 1.260x - 7.479$	0.999
B12	B12	02/05/2022	$y = 1.225x - 5.900$	0.998
B13	B13	04/05/2022	$y = 1.326x - 10.711$	0.999
B14	B14	07/05/2022	$y = 1.197x - 3.534$	0.999
B15	B15	04/05/2022	$y = 1.096x - 0.244$	0.998
B16	B16	04/05/2022	$y = 1.209x - 1.612$	1.000
B17	B17	03/05/2022	$y = 1.198x - 3.075$	0.999
B18	B18	07/05/2022	$y = 1.159x - 2.421$	0.999
B19	B19	03/05/2022	$y = 1.053x + 1.562$	0.999
B20	B20	03/05/2022	$y = 1.206x - 6.147$	1.000
B21	B21	04/05/2022	$y = 1.156x - 0.999$	0.998
B22	B22	04/05/2022	$y = 1.293x - 8.368$	0.998
B23	B23	07/05/2022	$y = 1.149x - 2.644$	1.000
B24	B24	02/05/2022	$y = 1.250x - 7.392$	1.000
B25	B25	03/05/2022	$y = 1.131x - 2.476$	0.999
B26	B26	07/05/2022	$y = 1.154x + 1.978$	1.000
B27	B27	02/05/2022	$y = 1.278x - 8.984$	0.998
B28	B28	04/05/2022	$y = 1.093x - 0.217$	0.999
B29	B29	04/05/2022	$y = 1.280x - 9.168$	0.999
B30	B30	03/05/2022	$y = 1.290x - 8.822$	0.997
B31	B31	03/05/2022	$y = 1.116x - 0.814$	0.997
B32	B32	05/05/2022	$y = 1.156x - 3.473$	0.999
B33	B33	06/05/2022	$y = 1.254x - 8.880$	0.998
B34	B34	03/05/2022	$y = 1.157x - 1.629$	0.999

Calibrated by :

Phakhinai Khongkomnerd  
(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2567

REFERENCE No : 64386-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS 105DU

**SERIAL No** : 1126422905

**ID No** : BA 05/50

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : TETNITHI W.

**CALIBRATION DATE** : 11-Mar-22

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 17-Mar-22

**RECEIVED DATE** : 11-Mar-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.





## QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

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www.qcalibration.com

CERTIFICATE No : 22M2567

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS 105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA 05/50 RECEIVED DATE : 11-Mar-22  
AIR PRESSURE : 1008mbar  $\pm$  1mbar CALIBRATION DATE : 11-Mar-22  
AMBIENT TEMPERATURE : 22° C  $\pm$  1° C RELATIVE HUMIDITY : 49 %RH  $\pm$  10 % RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	OK-I-151	C02210415	09-Feb-23

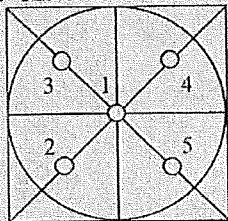
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

#### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 20 g WAS 0.000004 g
4. REPEATABILITY OF READING AT 100 g WAS 0.000048 g
5. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000058
0.02	0.01999	0.00001	0.000058
0.10	0.09999	0.00001	0.000059
0.20	0.19999	0.00001	0.000059
0.50	0.50001	-0.00001	0.000058
1.00	1.00001	-0.00001	0.000059
2.00	2.00000	0.00000	0.000059
5.00	5.00001	-0.00001	0.000061
10.00	10.00005	-0.00005	0.000063
20.00	20.00006	-0.00006	0.000069
50.00	50.0000	0.0000	0.00011
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

#### 6. OFF CENTER LOADING ERROR



POINT	READING (g)	
1	10.00001	50.0000
2	10.00002	50.0000
3	10.00001	50.0000
4	10.00001	50.0000
5	10.00002	50.0001
OFF-CENTER LOADING	0.00001	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

## CALIBRATION CERTIFICATE

**Submitted by** : S.P.S. Consulting Service Co.,Ltd.  
**Address** : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.  
**Calibrated at** : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

**Description** : Sound Calibrator  
**Manufacturer** : ACO  
**Model** : 2127  
**Serial No.** : 130006

### Ambient Environment

**Temperature** :  $(23 \pm 3) ^\circ\text{C}$   
**Relative Humidity** :  $(50 \pm 15) \%$   
**Ambient Pressure** :  $(101.325 \pm 1.500) \text{ kPa}$

**Standards used** : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

**Calibration Procedure**: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

**Date of Receipt** : 22 Apr. 2022

**Date of Calibration** : 28 Apr. 2022

*M. N. B. /*

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.93	-0.07	$\pm 0.10$	$\pm 0.40$ dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	$\pm 1.5$	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.44	$\pm 0.50$	$\pm 3.0\%$

- Note :
1. No adjustment.
  2. The calibrator pressure correction was not included.
  3. The microphone volume correction was not included.

Calibrated by :

N. N. #137  
(Mr. Nuttapong Niljrusvanit)

Taw  
(Mr. Tawikiat Iamsamran)

Approved by :

Prawate Kluaypa  
(Mr. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 28 Apr. 2022

Date of Issue : 28 Apr. 2022

Ref : 2011265042601787001

2 / 2

End of Certificate

The results relate only to the items tested/calibrated or value assigned.  
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FM.BL.MTC.002 Rev.4



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Tel : (662) 939-1370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Noise B\_373/22

### Sound Level Meter Calibration Report

#### Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	28 April 2022
		Due Date	28 April 2023

#### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B01	ACO	6236	00132025	19 June 2022	94.1	94.0
ACO-B16	ACO	6236	00172039	19 June 2022	94.0	94.0
ACO-B29	ACO	6236	00182011	19 June 2022	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.93 ± 0.10 dB	

Calibrated by : Phakhinai Khongkomnerd  
(Mr. Phakhinai Khongkomnerd)

Approved by : Peera Detudom  
(Mr. Peera Detudom)

คุณภาพน้ำ

# CAL

Calibratech Co.,Ltd.

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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 65-400210-1

**Page :** 1 of 2

**Submitted by :** S. P. S Consulting Service Co.,Ltd.

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

**Equipment :** Liquid in Glass Thermometer

**Manufacturer :** SK

**Model :** N/A

**Range :** 0 °C to 100 °C

**Resolution :** 1 °C

**Serial No. :** N/A

**Immersion :** Total

**ID No. :** TM21/59

**Environment :** Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

**Date of Received :** 19 April 2022

**Date of Calibration :** 23 April 2022

**Date of Issue :** 23 April 2022

**Calibrated by :** Chortip Samchusri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units

**1. Platinum Resistance Thermometer (PRT)**

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)

**2. Standard Digital Thermometer**

ID No.	Cert. No.	Due Date	Traceability
400003	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)
400004	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.





# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

## Certificate of Calibration

Certificate No. : 65-400210-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.6439 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
20.6690	20	0.7	0.31

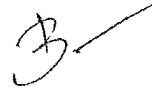
### Remark

UUC : Unit Under Calibration


This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%

- oOo -



<b>Lambda UV Preventive Maintenance (PM)</b>			
<b>Company Name:</b>	S.P.S. CONSULTING SERVICE CO., LTD.		
<b>Address:</b>	7, Soi Phaholyothin24, Ladyao, Jatujak, Bangkok		
<b>User Name:</b>	K. Benjawan	<b>WO Number:</b>	WO-01550999
<b>Telephone Number:</b>	086-141-2523	<b>PM Number:</b>	6 of 6 P
<b>Customer Support Engineer:</b>	K. Anon	<b>Certificate Number:</b>	UV2004-2022
<b>Date PM Performed:</b> (DD-MMM-YYYY)	25-Jan-2022	<b>Next PM Due Date:</b> (DD-MMM-YYYY)	25-Jul-2022

Part Number	Release	Publication Date	
09370504	B	March 2013	

### Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer Lambda UV/Vis Spectrophotometer by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

### General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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## Component List

Component Specific Model	Serial #	Software Version		Configuration Notes
Lambda 25	501S14123010	6.2.0.0741	STD	1.27
NA	NA	NA	NA	NA

## Parts Lists

Parts Included with the PM				
Part Number (if applicable)	Description	Quantity	Serial Number	Expiration Date (MM/YY)
B250 0099	Stray Light standard			
	Nal cell	1	1943	Jan-22
	NaNO2 cell	1	2963	
	KCl cell	1	31030	
	H2O	1	71497	
B050 7805	Secondary Standards for calibration of wavelength and photometric accuracy or use NBS/NIST 390 standards			
	Gray Glass G1	1	2926	Jan-22
	Gray Glass G2	1	3501	
	Gray Glass G3	1	2552	
	Holmium Glass	1	1085	

Additional Tools Required for PM					
Part Number (if applicable)	Description	Quantity	Serial #		Remark
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Additional Reagents and Standards Required for PM					
Part Number (if applicable)	Description	Quantity	Batch/Lot #		Expiration Date (MM/YY)
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

## Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. Optical checks:

- ☒ Lamp Alignment/Energy
- ☒ Sample Compartment Windows/Monochromator
- ☒ Mirror and Grating Alignment
- ☒ Cell Holder Alignment

### 3. Mechanical:

- ☒ Physical inspection – Please write any comments in the additional comments section.
- ☒ Grating Drive Mechanism.
- ☒ Lamp Change Mechanism.
- ☐ Slit Drive Manual Servo.

### 4. Test:

Refer to Appendix A for the specifications of the instrument being tested.

- ☒ D2 Wavelength accuracy

	Actual Value	Specification
Accuracy at 656.1 nm	656.16	± 0.1

☒ Holmium Oxide wavelength accuracy

Filter ID #		1085		
Test	Calibration Value	Actual Value	Deviation	Specification
279.3 nm	279.3	279.39	-0.09	± 0.5
360.8 nm	360.9	360.93	-0.03	± 0.5
459.9 nm	460.0	460.07	-0.07	± 0.5
536.4 nm	536.2	536.40	-0.20	± 0.5

☒ Scattered Light.

Test	Filter ID #	Result	Specification
NaI @ 220 nm	1943	0.0133	< 0.02 %T
NaNO <sub>2</sub> @ 340 nm	2963	-0.1296	< 0.02 %T
NaNO <sub>2</sub> @ 370 nm	2963	-0.0002	< 0.02 %T
KCl @ 200 nm	31030	2.4808	≥ 2 A

☒ Baseline Flatness.

Corrected Baseline	Specification
0.000163	± 0.001 A

☒ Noise Test @ 500 nm.

Actual Value	Specification
0.0000240	± 0.00008 A

☒ Photometric Accuracy.

Filter 1 ID #		2926		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.3483	0.3493	-0.0010	± 0.006 A
546 nm	0.3029	0.3046	-0.0017	± 0.006 A
635 nm	0.3200	0.3232	-0.0032	± 0.006 A
Filter 2 ID #		3501		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	1.001	1.0024	-0.0014	± 0.006 A
546 nm	0.9797	0.9813	-0.0016	± 0.006 A
635 nm	1.0285	1.0325	-0.0040	± 0.006 A
Filter 3 ID #		2552		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.489	0.4935	-0.0045	± 0.006 A
546 nm	0.4582	0.4595	-0.0013	± 0.006 A
635 nm	0.5046	0.5075	-0.0029	± 0.006 A

**5. Accessory (where applicable):**

- ☐ Integrating Sphere
- ☐ Reflecting Attachment
- ☐ Cell Changer
- ☐ Sipper
- ☐ Auto Sampler

**6. Review:**


- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.



## Additional Comments

Additional Comments Regarding the PM

## Review

<p><i>The preventive maintenance checks and if applicable performance tests for Lambda UV have been completed.</i></p>	
<p><i>This Lambda UV Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p><b>Review of Preventive Maintenance:</b></p>	
<p>Authorized PerkinElmer Representative:</p> <p>Anon Leenthawonkit </p>	<p>Date:</p> <p>25-Jan-2022 (DD-MM-YYYY)</p>
<p>Authorized Customer Representative:</p>	<p>Date:</p> <p>25-Jan-2022 (DD-MM-YYYY)</p>



CERT NO.: C22/0066B

PAGE : 1 OF 3

**ISOCAL TECHNOLOGY CO.,LTD.  
INDUSTRIAL INSTRUMENT CALIBRATION CENTER**

170/405 Moo 3 Serithai Rd., Kannayao Kannayao Bangkok 10230

Tel. 0-2906-3040-1 Fax. 0-2919-9948

**Certificate of Calibration**

EQUIPMENT : PH METER

MODEL : HI98190

SERIAL NO. : 04260035101

ID NO. : B01


MANUFACTURER : HANNA

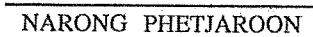
MADE IN : ROMANIA

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO.,LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,JOMPOL,  
CHATUCHAK , BANGKOK

AMBIENT TEMPERATURE : ( 23  $\pm$  2 ) °C

RELATIVE HUMIDITY : ( 50  $\pm$  15 ) %

CALIBRATED BY: WATCHARA INCHAIDEE  
TECHNICIAN  


APPROVED BY :  
  
NARONG PHETJAROON

ISSUE DATE : 23-Mar-2022

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WRITTEN APPROVAL OF THE HEAD OF THE INDUSTRIAL INSTRUMENTS CALIBRATION CENTER.



**ISOCAL TECHNOLOGY CO., LTD.**

**CALIBRATION REPORT**

**CERT NO.: C22/0066B**

**PAGE : 2 OF 3**

**EQUIPMENT :** PH METER  
**MANUFACTURER :** HANNA  
**MODEL :** HI98190  
**SERIAL NO. :** 04260035101  
**ID NO. :** B01  
**CALIBRATION DATE :** 19-Mar-2022  
**RECEIVED DATE :** 17-Mar-2022  
**PROCEDURE USED :**

CALIBRATION WERE CONDUCTED USING IN-HOUSE CALIBRATION PROCEDURE WI-18-22 ACCORDING TO COMPARISON WITH PH SOLUTION STANDARD.

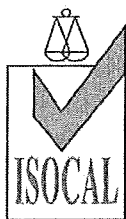
**CONDITION OF THIS RESULT OF CALIBRATION**

1. THIS RESULT OF CALIBRATION WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
2. THIS CERTIFICATE IS TRACEBLE TO THE INTERNATIONAL OF THIS RESULT OF CALIBRATION.
3. REFERENCE STANDARDS INSTRUMENTS :-

PH SOLUTION MODEL PH 4.01 SERIAL NO. 1.09435.1000 CERT. NO HC02910835 DATE 24-APR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.

PH SOLUTION MODEL PH 7.01 SERIAL NO. 1.09439.1000 CERT. NO HC02387439 DUE DATE 18-APR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.

PH SOLUTION MODEL PH 10.01 SERIAL NO. 1.09438.1000 CERT. NO HC01501438 DUE DATE 27-MAR-2022  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY(NIST), U.S.A  
-PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB),GERMANY.  
THROUGH SUPELCO CO., LTD.



**ISOCAL TECHNOLOGY CO., LTD.**

**CALIBRATION REPORT**

**CERT.NO.: C22/0066B**

**PAGE : 3 OF 3**

**RESULT OF CALIBRATION:** ADJUSTMENT ( YES )

**FUNCTION:** PH MEASUREMENT WITH SOLUTION @ 25 °C

**SCALE RANGE :** 4.01 pH TO 10.01 pH

**RESOLUTION:** 0.01 pH

STANDARD VALUE ( pH )	UUC READING ( pH )	ERROR ( pH )	UNCERTAINTY ( pH )
4.01	3.97	-0.04	0.012
7.01	7.03	0.02	0.012
10.01	10.04	0.03	0.012

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON STANDARD  
UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF  
CONFIDENCE OF APPROXIMATELY 95%

UUC = UNIT UNDER CALIBRATE

- oOo -

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2569

REFERENCE No : 64386-3

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591843

**ID No** : BA 09/61

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : TETNITHI W.

**CALIBRATION DATE** : 11-Mar-22

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 17-Mar-22

**RECEIVED DATE** : 11-Mar-22

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# QUALITY CALIBRATION CO.,LTD.

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www.qcalibration.com

CERTIFICATE No : 22M2569

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW  
MANUFACTURER : SARTORIUS S/N : 36591843  
ID No : BA 09/61 RECEIVED DATE : 11-Mar-22  
AIR PRESSURE : 1008mbar  $\pm$  1mbar CALIBRATION DATE : 11-Mar-22  
AMBIENT TEMPERATURE : 22°C  $\pm$  1°C RELATIVE HUMIDITY : 51 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02210415	09-Feb-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

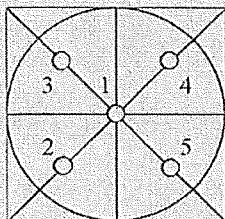
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.0000	0.0000	0.000078
0.10	0.1000	0.0000	0.000078
0.20	0.2000	0.0000	0.000078
0.50	0.5000	0.0000	0.000079
1.00	1.0000	0.0000	0.000079
2.00	2.0000	0.0000	0.000080
5.00	5.0000	0.0000	0.000081
10.00	10.0000	0.0000	0.000084
20.00	20.0000	0.0000	0.000089
50.00	50.0000	0.0000	0.00011
100.00	100.0000	0.0000	0.00019
200.00	199.9999	0.0001	0.00032

### 5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9999
2	99.9999
3	100.0000
4	99.9999
5	99.9998
OFF-CENTER LOADING	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES**

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

**Cert.No.: 22TW98**

**Page.: 1 of 2**

## **Certificate of Testing**

<b>Equipment :</b>	DO Meter
<b>Manufacturer :</b>	YSI
<b>Model :</b>	5000-230V
<b>Serial No. :</b>	15B100751
<b>ID No. :</b>	-
<b>Received Date :</b>	20 April 2022
<b>Test Date :</b>	21 April 2022
<b>Reference :</b>	2204-0429WC-1
<b>Submitted by :</b>	S.P.S. Consulting Service Co.,Ltd. 7 Phaholyothin 24, Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900
<b>Laboratory Condition :</b>	Temperature ( $25 \pm 5$ ) °C Humidity ( $50 \pm 20$ ) %
<b>Test Procedure :</b>	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
<b>Tested by :</b>	Walalak Sirithean

**Approved by :**

Approved Signatory

- ( ☒ ) Malee Butkruea  
( ☐ ) Saithip Meangmai  
( ☐ ) Warakorn Lernagtrakul

**Issue Date :**

25 April 2022

**B 0286555**



Cert.No.: 22TW98

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	21MM430	21 Sep 2022

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 14J100195

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation (mg/L)</b>
8.12	8.14	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22T0570  
REFERENCE No : 63773-2

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200

**SERIAL No** : 15110C0498

**ID No** : DRB 06/59

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 21-Jan-22

**APPROVED BY** : PONGSAK J.

**ISSUED DATE** : 21-Jan-22

**RECEIVED DATE** : 19-Jan-22

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QUALITY CALIBRATION CO., LTD.

F-G010 REV : 02



# QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22T0570

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : DRB 06/59  
RECEIVED DATE : 19-Jan-22  
AMBIENT TEMPERATURE : 23° C ± 1° C  
MODEL : DRB 200  
SERIAL NUMBER : 15110C0498  
CALIBRATION DATE : 21-Jan-22  
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

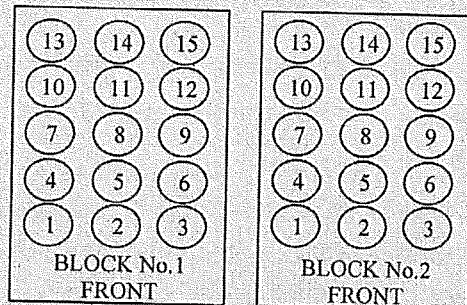
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	21T6767	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.		1	2
Controller temperature (°C)		145	145
Indicating Temperature		145	145
Measured Temperature (°C) at Spread Locations	1	150.5	150.5
	2	150.6	150.1
	3	149.7	149.7
	4	150.2	150.7
	5	149.9	149.9
	6	150.1	150.4
	7	150.1	150.4
	8	149.7	150.7
	9	150.6	150.7
	10	149.6	150.6
	11	149.9	150.6
	12	149.6	150.0
	13	149.7	150.1
	14	149.8	150.2
	15	149.6	150.2
Uncertainty of Measurement(± °C)		0.86	0.86

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.


NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

## ***PinAAcle 900Z Preventive Maintenance (PM)***

<b>Company Name:</b>	S.P.S.CONSULTING SERVICE CO.,LTD.		
<b>Address (Instrument Location):</b>	PHAHOLYOTHIN RD, JOMPON, BANGKOK, 51, TH, 10900		
<b>Serial Number:</b>	PZAS19090402	<b>PM Number:</b>	1/2
<b>Customer Name (if applicable):</b>	K. PHENPHA	<b>Telephone Number:</b>	083-926-9252
<b>Customer Support Engineer Name:</b>	K. DUANG	<b>Service Order Number:</b>	WO-01473846
<b>Date PM Performed: (DD-MMM-YYYY)</b>	01-Jun-2022	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	01-Dec-2022
<b>Standard Labor Hours to Complete PM :</b>		<b>5 hours</b>	

Part Number	Release	Publication Date	
09370144 Rev.9	A	January 2018	

### **Scope**

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900Z by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

### **General Instructions:**

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.



## Component List

Component / Specific Model	Serial #	Configuration Notes
AS900	AS9419052359	Syngistix 3.1

## Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
B3002013	THGA Contact Cylinders	1
B3141064	Glycerol for THGA Cooling	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300244	GFAAS Mixed Standard	AR	56-021CRY1	30-Jun-2023

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

## Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN
- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function

#### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

#### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

#### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

#### 7. After PM Performance tests [THGA]:

##### 7.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min $\pm$ 25 mL/min	255	Passed
External Flow Rate	100 mL/min $\pm$ 10 mL/min	105	Passed

##### 7.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	$\leq$ 0.005 Abs.	0.0001	Passed
Standard Deviation	$\leq$ 0.005	0.0002	Passed

##### 7.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr $m_0$ Results	$\leq$ 7.0 pg/0.0044 A-s	5.6	Passed
Precision	$\leq$ 2.0 %	0.56	Passed

#### 7.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m <sub>0</sub> Result	≤ 16.5 pg/0.0044 A-s	14.1	Passed
Zeeman Ratio	0.52 ± 0.04	0.53	Passed

#### 8. Review:

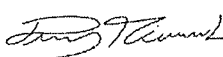
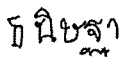
- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.



## Additional Comments

Additional Comments Regarding the PM	
<p>Zeeman Ratio =</p>	$\frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}}$
<p>=</p>	$\frac{0.1609}{0.1609 + 0.1377}$
<p>=</p>	<p style="text-align: center;">0.53</p>
<p style="text-align: center;">REPLACE PM KIT FOR PinAAcle900Z</p>	

## Review

<p><i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900Z have been completed.</i></p>	
<p><i>This PinAAcle 900Z Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p><b>Review of Preventive Maintenance:</b></p>	
<p>Authorized PerkinElmer Representative:</p>	<p style="text-align: center;"></p>
<p>Authorized Customer Representative:</p>	<p style="text-align: center;"></p>
	<p>Date: 01-Jun-2022 (DD-MMM-YYYY)</p>
	<p>Date: 01-Jun-2022 (DD-MMM-YYYY)</p>



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u>	<b>Date Tested:</b> <u>January 12, 2022</u>	
	<b>Recommendation Recertification</b>	
<b>Address :</b> <u>7 Soi Phaholyothin 24</u>	<b>Period</b> <u>6</u> <b>Months</b>	
<u>Paholyothin Road</u>	<b>Recertification Due:</b> <u>July 12, 2022</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	<b>Date Last Certified:</b> <u>July 14, 2021</u>	
<b>User Name:</b> <u>K.Phenpha Viphasathawat</u>	<b>Visit Number:</b> <u>2 of 2</u>	
<b>Phone:</b> <u>083-9269252</u>	<b>PerkinElmer Phone:</b> <u>02-719-6420 ext 206</u>	
<b>Fax:</b> <u>02-513-4221</u>	<b>PerkinElmer Fax:</b> <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
<u>IPV Methods</u>		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>August 30, 2022</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>January 30, 2022</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>June 30, 2022</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>August 30, 2022</u>
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED January 12, 2022**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER : 077C7042401

DATE TESTED : January 12, 2022

PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007		0.00554	
	Ni 231.604 nm	≤ 0.008		0.00725	
	Ni 341.476 nm	≤ 0.012		0.00752	
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020		0.01616	
	Ba 455.403 nm	≤ 0.025		0.02416	
Precision					
	As 193.656 nm	% RSD < 1.0		0.34	%
	Zn 213.856 nm	% RSD < 1.0		0.27	%
	Mn 257.610 nm	% RSD < 1.0		0.41	%
	La 379.478 nm	% RSD < 1.0		0.57	%
	Ba 455.403 nm	% RSD < 1.0		0.33	%
	Ba 493.408 nm	% RSD < 1.0		0.26	%
Detection Limits : Axial	Tl 190.080 nm	3(sd)		5.51	ppb
	As 193.696 nm	3(sd)		8.59	ppb
	Pb 220.353 nm	3(sd)		0.50	ppb
Detection Limits : Radial	As 193.696 nm	3(sd)		21.00	ppb
	Zn 213.856 nm	3(sd)		0.32	ppb
	Mn 257.610 nm	3(sd)		0.18	ppb
	La 379.478 nm	3(sd)		0.44	ppb
	Ba 455.403 nm	3(sd)		0.17	ppb
	Ba 493.408 nm	3(sd)		0.12	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb		12.46	
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb		30.82	



**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER 077C7042401DATE TESTED January 12, 2022

## Remarks :

Commissioning follow as commissioning performance sheets.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**

Authorized Representative: \_\_\_\_\_

(

Mr. Wiphan Promlumda

)

Service Engineer



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Certificate No. : SS2110-013-0003

Date Issued : 04-Oct-21

**Customer &** : S.P.S. CONSULTING SERVICE CO., LTD.  
**Calibrated Place** : 7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,  
Bangkok 10900

**Equipment** : Incubator

**Manufacturer** : BINDER

**Model** : BD 115

**Serial No.** : 12-16967

**ID No./Tag No.** : IN 05/56

**Date Received** : 01-Oct-21

**Date Calibrated** : 01-Oct-21

**Calibrated by** : Mr. Jame Khaothong

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

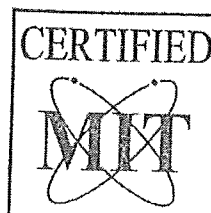
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by :

K. Nathong

(Mr. Nathapong Krudaum)



**Certificate No. :** SS2110-013-0003

**Environment :** Ambient Temperature : Start record 26.0 °C, Stop record 25.7 °C  
Relative Humidity : Start record 56.5 %RH, Stop record 55.7 %RH

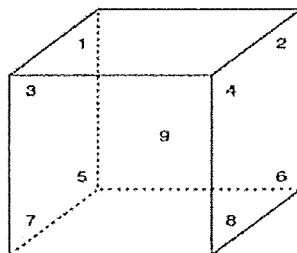
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
35	35.0	35.0	0.12	0.40	0.45
41.5	41.5	41.5	0.11	0.39	0.51

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> ±°C
35	35.01	35.11	34.95	35.00	34.99	34.95	35.07	35.07	35.23	0.23
41.5	41.47	41.47	41.40	41.49	41.37	41.33	41.43	41.51	41.62	0.22

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



#### Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2107-034-0001 for Digital Thermometer with Probe (Agilent) Module 1 (245) Serial No. US37005130, Due 04-Feb-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

- 2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

**End of Certificate**



**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com



CERTIFICATE No : 22T2575

REFERENCE No : 64387-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : WATER BATH

**MANUFACTURER** : MEMMERT

**MODEL** : WNB 29

**SERIAL No** : L614.0123

**ID No** : WB 05/58

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 11-Mar-22

**APPROVED BY** : PONGSAK J.

**ISSUED DATE** : 17-Mar-22

**RECEIVED DATE** : 11-Mar-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.



# QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 22T2575

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : WB 05/58  
RECEIVED DATE : 11-Mar-22  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
MODEL : WNB 29  
SERIAL NUMBER : L614.0123  
CALIBRATION DATE : 11-Mar-22  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

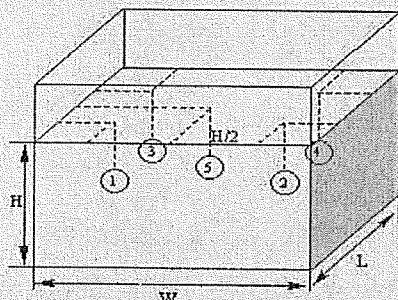
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	21T6761	05-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

**RESULT OF CALIBRATION :-** WITHOUT ADJUSTMENT



PROBE INSTALLATION  
POSITION IN THE BATH

### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.8
Overall Variation of Line Voltage (V) : 4
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 59*35*14 cm

### BATH PERFORMANCE

Calibration Point (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	0.05	0.04	0.05	0.09
60.0	0.04	0.05	0.05	0.12

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.3	50.3	50.07	50.08	50.05	50.04	50.07	0.14
60.3	60.3	60.03	60.07	60.07	60.07	60.03	0.14

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



### ***GC Clarus 600/680 Preventive Maintenance (PM)***

<b>Company Name:</b>	<b>S.P.S. Consulting Service Co.,Ltd</b>		
<b>Address (Instrument Location):</b>	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
<b>Serial Number:</b>	680S14042502	<b>Service Tag:</b>	N68APSSFEMP
<b>Customer Name (if applicable):</b>	Ms.Sujinda	<b>PM number:</b>	1 of 2
<b>Service Engineer Name:</b>	Pramote Chaisorn	<b>Service Order Number:</b>	WO-01624977
<b>Date PM Performed: (DD-MMM-YYYY)</b>	04-Mar-2022	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	04-Sep-2022

<b>Part Number</b>	<b>Release</b>	<b>Publication Date</b>	
TH09370070	C	August 2016	

#### **Scope**

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

#### **General Instructions:**

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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## Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom6.3.2	
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

## Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
LF21-0503	Fluke179 multimeter	1	22460228	04-Nov-2022
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				



## Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.35 Volt

*\*Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment \_\_\_\_\_

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

### 2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).

Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.



- ☒ Check flows, including split flows if applicable. Calibrate if necessary.
  - Carrier flow Pass
  - Split flow Pass
- ☒ Check detector gas flows and adjust if necessary.
  - Detector flow Pass
- ☒ Autosampler installed ☒ Yes ☐ No
  - Check autosampler sensor for wear and replace if necessary.
  - Vial sensor Pass
  - Door sensor Pass
  - Tower sensor Pass
  - Plunger sensor Pass
  - Elevator sensor Pass
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.
  - Firmware version 6.5
- ☒ Measure all accessible power supply voltages.
  - 5 Volt Pass
  - +15 Volt Pass
  - 15 Volt Pass
  - 24 Volt Pass
- ☒ Record all detector voltage signal.
  - Detector Channel A 0.91 mV.
  - Detector Channel B NA mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.
  - ☒ BRAM Pass
  - ☒ EPROM Pass
- ☒ Run Autosampler diagnostics.
  - ☒ BRAM Pass
  - ☒ EPROM Pass

### 4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.



## Additional Comments

Additional Comments Regarding the PM

## Review

<i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i>	
<i>This Clarus600/680 GC      Pass      the preventive maintenance.</i>	
<b>Review of Preventive Maintenance:</b>	
Authorized PerkinElmer Representative: Pramote Chaisorn	Date: 04-Mar-2022 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 04-Mar-2022 (DD-MMM-YYYY)